

TITLE OF THE INVENTION

Speaker Unit

BACKGROUND OF THE INVENTION

5 The present invention relates to a speaker unit, in particular to a speaker unit which is thin in thickness and has an elliptical shape.

10 There has been known a thin type speaker unit which is for use in a television set and whose vibrating diaphragm is usually formed into an elliptical shape. On the other hand, it is usually required that a magnetic circuit of a speaker unit be formed in a manner such that it can provide a uniform magnetic flux to the surface of a cylindrical voice coil. Accordingly, it is often required that a top plate and a
15 permanent magnet each having a circular doughnut shape be used so that the whole magnetic circuit has a cylindrical shape.

20 In fact, a thin type speaker unit usually has a magnetic circuit whose outer diameter is equal to or smaller than a width in a short axis direction of a frame structure which supports a vibrating diaphragm. In this way, a speaker unit as a whole may be made smaller, thus meeting with a requirement of making a compact speaker unit.

25 However, in a thin type speaker unit as above related, since a magnetic circuit has to be made small in size due to a restriction caused by a width in the short axis direction of a vibrating diaphragm, the magnetic flux to be applied to the

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surface of a voice coil will have a low density, resulting in a problem that the speaker unit has only a low sensitivity.

SUMMARY OF THE INVENTION

5 It is an object of the present invention to provide an improved speaker unit so as to solve the above-mentioned problem peculiar to the above-mentioned prior art.

10 According to the present invention, there is provided a speaker unit comprising: an elliptical vibrating diaphragm; a cylindrical voice coil secured at one end thereof on the center of the elliptical vibrating diaphragm; a frame structure for movably supporting the vibrating diaphragm, said frame structure being formed into a rectangular or elliptical shape and having a through hole in the center thereof; a
15 magnetic circuit formed by (1) a top plate having a rectangular shape and having a through hole in the center thereof, (2) a plate-shaped magnet having a rectangular shape and having a through hole in the center thereof, (3) a back plate having a rectangular shape and having an upright pole on
20 the center thereof. In this speaker unit, the top plate, the plate-shaped magnet and the back plate each has a width which is narrower than that of the frame structure in its shorter axis.

25 According to one aspect of the present invention, the frame structure, the top plate, the plate-shaped magnet and the back plate are arranged in parallel relation with one

another.

The above objects and features of the present invention will become more understood from the following description with reference to the accompanying drawings.

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BRIEF DESCRIPTION OF DRAWINGS

Fig. 1 is an exploded perspective view showing a series of elements for forming a magnetic circuit for use in a speaker unit according to the present invention.

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Fig. 2 is an end view showing a speaker unit of the present invention in its shorter axis.

Fig. 3 is a side view showing a speaker unit of the present invention in its longer axis.

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Fig. 4 is a perspective view showing a frame for use in the speaker unit of the present invention.

Fig. 5a is a front view showing a television set in which the speaker unit of the present invention is applied.

Fig. 5b is a top plane view showing the television set of Fig. 5a.

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DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

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Referring to Fig. 1, reference numeral 1 represents a rectangular top plate which is made of a magnetic material and has a center hole 1a. Reference numeral 2 represents a rectangular plate-shaped magnet having a center hole 2a. Reference numeral 3 represents a back plate 3 made of a

magnetic material and having a center pole 3a smaller in diameter than hole 1a. Reference numeral 4 represents another plate-shaped magnet having a central hole 4a. The magnet 4 is used to cancel leaked magnetic flux from the magnet 2. Reference numeral 5 represents a case made of a magnetic material for receiving the top plate 1, the magnet 2, the back plate 3 and the magnet 4.

In use, the top plate 1 serves as a lid to cooperate with the case 5 so as to receive the magnet 2, the back plate 3 and the magnet 4. In this way, magnetic flux possibly leaked from the magnet 2 will be effectively blocked so as to be confined within the case 5.

Referring to Figs. 2 - 4, reference numeral 6 represents a rectangular parallelepiped frame structure which is used to movably support an elliptical vibrating diaphragm (not shown). As shown in Fig. 4, the frame structure 6 is formed with a elliptical recess portion 6a for receiving an elliptical vibrating diaphragm. ^B Further, a center hole 6b, which has the same diameter as that of the center hole 1a of the top plate 1, is formed on the bottom of the elliptical recess portion 6a.

Referring again to Figs. 1 and 3, the frame structure 6, the top plate 1, the magnet 2, the back plate 3 and the magnet 4 are assembled together with their longer axes arranged in parallel with one another.

Referring to Fig. 3, the frame structure 6 is the longest

in length.

After being assembled into a condition as shown in Fig. 3, the hole 1a of the top plate 1, the hole 2a of the magnet 2, the hole 4a of the magnet 4 and the hole 6a of the frame structure 6 are all aligned in a vertical line so that the centers of these holes become coincident with one another, thereby permitting the center pole 3a of the back plate 3 to be inserted through all these holes. In this way, a magnetic circuit is formed by virtue of the top plate 1, the magnet 2 and the back plate 3. A magnetic gap is formed in an annular space formed between the inner wall of the hole 1a and the surface of the center pole 3a. A cylindrical voice coil ^A ~~(not shown)~~ having one end thereof fixed at the center of a vibrating diaphragm (not shown) is inserted in the annular space.

Referring to Fig. 2, the frame structure 6 has a larger width than the top plate 1, the magnet 2 and the back plate 3. As compared with a conventional speaker unit where a doughnut-shaped magnet is used to form a cylindrical magnetic circuit, since the magnet 2 in the present invention has a larger volume than that in prior art, the magnetic flux to be applied to the voice coil will have a larger density. Further, since the magnetic circuit in the present invention is shorter in its longer axis and narrower in its shorter axis than the frame structure 6, a cabinet (into which the speaker unit is to be received) is required to have only a small

volume which may be the same as that of a cabinet for a conventional speaker unit (having a cylindrical magnetic circuit), but achieving a higher sensitivity than a conventional speaker unit.

5 Fig. 5a is a front view and Fig. 5b is a top plane view, showing an example where the speaker unit of the present invention is installed in a television set. As shown in Fig. 5a, the television set comprises a frame 10 holding a display 30. Provided on either side of the display 30 is a speaker unit 20 manufactured in accordance with the present invention. It has been found that the speaker unit of the present invention is particularly suitable for use in a television set in which there is only an elongate narrow space for installing a speaker unit.

10 15 It is understood from the above description that with the use of the present invention, the magnet of a speaker unit is allowed to be made larger than prior art so that the magnetic flux to be applied to the voice coil will have a higher density than prior art, thereby enabling a speaker unit to obtain an improved sensitivity.

20 Further, since the magnetic circuit in the present invention is shorter in its longer axis and narrower in its shorter axis than a frame structure for supporting a vibrating diaphragm, a cabinet (into which the speaker unit is to be received) is required to have only a small volume which may be 25 the same as that of a cabinet for a conventional speaker unit

